



Analytical Laboratory

Page 1 of 16

13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: J13050293

Project Name: WWTS FGD-Routine 2013

Customer Name(s): Bill K, Wayne C, Melonie M, and T. THORNTON

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: _____ **Date:** 6/11/2013
(Signature) Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

| Sample ID | Plant/Station | Collection Date and Time | Collected By | Sample Description |
|-----------------|---------------|-----------------------------|-----------------|--------------------|
| 2013011142 | BELEWS | 15-May-15 7:00 AM | TRAVIS THORNTON | FGD Purge Eff |
| 2013011143 | BELEWS | 15-May-15 7:05 AM | TRAVIS THORNTON | EQ Tank Eff |
| 2013011144 | BELEWS | 15-May-15 7:10 AM | TRAVIS THORNTON | BioReactor 1 Inf |
| 2013011145 | BELEWS | 15-May-15 7:15 AM | TRAVIS THORNTON | BioReactor 2 Inf |
| 2013011146 | BELEWS | 15-May-15 7:20 AM | TRAVIS THORNTON | BioReactor 2 Eff |
| 2013011147 | BELEWS | 15-May-15 8:00 AM | TRAVIS THORNTON | Filter Blk |
| 2013011148 | BELEWS | 29-Apr-13 2:00 PM | C.KNOX | TRIP BLANK |
| 7 Total Samples | | | | |

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

☒ Yes☐ No

All Results are less than the laboratory reporting limits.

☐ Yes☒ No

All laboratory QA/QC requirements are acceptable.

☒ Yes☐ No

Report Sections Included:

☒ Job Summary Report☒ Sample Identification☒ Technical Validation of Data Package☒ Analytical Laboratory Certificate of Analysis☐ Analytical Laboratory QC Report☒ Sub-contracted Laboratory Results☐ Customer Specific Data Sheets, Reports, & Documentation☐ Customer Database Entries☒ Chain of Custody☒ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DBA Account

Date: 6/11/2013

Certificate of Laboratory Analysis

Page 4 of 16

*This report shall not be reproduced, except in full.***Order # J13050293**

Site: FGD Purge Eff

Collection Date: 15-May-15 7:00 AM

Sample #: 2013011142

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|--|----------|--------|------------|-----|-----|---------------|--------------------|---------|
| <u>NITRITE + NITRATE (COLORIMETRIC)</u> | | | | | | | | |
| Nitrite + Nitrate (Colorimetric) | 5.2 | mg-N/L | | 0.1 | 10 | EPA 353.2 | 05/20/2013 12:31 | BGN9034 |
| <u>INORGANIC IONS BY IC</u> | | | | | | | | |
| Bromide | 83 | mg/L | | 5 | 50 | EPA 300.0 | 05/21/2013 17:02 | JAHERMA |
| <u>MERCURY (COLD VAPOR) IN WATER</u> | | | | | | | | |
| Mercury (Hg) | 236 | ug/L | | 5 | 100 | EPA 245.1 | 05/23/2013 13:45 | AGIBBS |
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | 168 | mg/L | | 0.5 | 10 | EPA 200.7 | 05/24/2013 12:45 | DJSULL1 |
| <u>DISSOLVED METALS BY ICP-MS</u> | | | | | | | | |
| Selenium (Se) | 108 | ug/L | | 10 | 10 | EPA 200.8 | 06/06/2013 12:58 | DJSULL1 |
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | 150 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Cadmium (Cd) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Chromium (Cr) | 218 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Copper (Cu) | 99.0 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Nickel (Ni) | 175 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Selenium (Se) | 2500 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Silver (Ag) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| Zinc (Zn) | 190 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:05 | KRICAR |
| <u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | | | | | Vendor Method | | V_AS&C |

Site: EQ Tank Eff

Collection Date: 15-May-15 7:05 AM

Sample #: 2013011143

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|---|--------|-------|------------|-----|----|-----------|--------------------|---------|
| <u>MERCURY (COLD VAPOR) IN WATER</u> | | | | | | | | |
| Mercury (Hg) | 191 | ug/L | | 2.5 | 50 | EPA 245.1 | 05/23/2013 13:47 | AGIBBS |
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | 162 | mg/L | | 0.5 | 10 | EPA 200.7 | 05/24/2013 12:49 | DJSULL1 |
| <u>DISSOLVED METALS BY ICP-MS</u> | | | | | | | | |
| Selenium (Se) | 72.0 | ug/L | | 10 | 10 | EPA 200.8 | 06/06/2013 13:02 | DJSULL1 |

Certificate of Laboratory Analysis

Page 5 of 16

*This report shall not be reproduced, except in full.***Order # J13050293**

Site: EQ Tank Eff

Collection Date: 15-May-15 7:05 AM

Sample #: 2013011143

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|--|--------|-------|------------|-----|----|-----------|--------------------|---------|
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | 143 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Cadmium (Cd) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Chromium (Cr) | 208 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Copper (Cu) | 95.3 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Nickel (Ni) | 173 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Selenium (Se) | 2330 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Silver (Ag) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |
| Zinc (Zn) | 186 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:08 | KRICHAR |

Site: BioReactor 1 Inf

Collection Date: 15-May-15 7:10 AM

Sample #: 2013011144

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|---|----------|--------|------------|-----|----|---------------|--------------------|---------|
| <u>NITRITE + NITRATE (COLORIMETRIC)</u> | | | | | | | | |
| Nitrite + Nitrate (Colorimetric) | 7.7 | mg-N/L | | 0.1 | 10 | EPA 353.2 | 05/20/2013 12:33 | BGN9034 |
| <u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | ug/l | | | | Vendor Method | | V_AS&C |
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | 152 | mg/L | | 0.5 | 10 | EPA 200.7 | 05/24/2013 12:53 | DJSULL1 |
| <u>DISSOLVED METALS BY ICP-MS</u> | | | | | | | | |
| Selenium (Se) | 73.3 | ug/L | | 5 | 5 | EPA 200.8 | 06/06/2013 13:05 | DJSULL1 |
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Cadmium (Cd) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Chromium (Cr) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Copper (Cu) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Nickel (Ni) | 14.2 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Selenium (Se) | 70.5 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Silver (Ag) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| Zinc (Zn) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:11 | KRICHAR |
| <u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | | | | | Vendor Method | | V_AS&C |

Certificate of Laboratory Analysis

Page 6 of 16

*This report shall not be reproduced, except in full.***Order # J13050293**

Site: BioReactor 2 Inf

Collection Date: 15-May-15 7:15 AM

Sample #: 2013011145

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|---|-----------------|-------|------------|-----|----|---------------|--------------------|---------|
| <u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | ug/l | | | | Vendor Method | | V_AS&C |
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | 152 | mg/L | | 0.5 | 10 | EPA 200.7 | 05/24/2013 12:57 | DJSULL1 |
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Cadmium (Cd) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Chromium (Cr) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Copper (Cu) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Nickel (Ni) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Selenium (Se) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Silver (Ag) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |
| Zinc (Zn) | < 10 | ug/L | | 10 | 10 | EPA 200.8 | 06/03/2013 13:15 | KRICHR |

Site: BioReactor 2 Eff

Collection Date: 15-May-15 7:20 AM

Sample #: 2013011146

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|---|------------------|--------|------------|------|----|---------------|--------------------|---------|
| <u>NITRITE + NITRATE (COLORIMETRIC)</u> | | | | | | | | |
| Nitrite + Nitrate (Colorimetric) | < 0.01 | mg-N/L | | 0.01 | 1 | EPA 353.2 | 05/20/2013 12:46 | BGN9034 |
| <u>INORGANIC IONS BY IC</u> | | | | | | | | |
| Bromide | 79 | mg/L | | 5 | 50 | EPA 300.0 | 05/21/2013 17:21 | JAHERMA |
| <u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | ug/l | | | | Vendor Method | | V_AS&C |
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | 157 | mg/L | | 0.5 | 10 | EPA 200.7 | 05/24/2013 13:01 | DJSULL1 |
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | < 5 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Cadmium (Cd) | < 5 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Chromium (Cr) | < 5 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Copper (Cu) | 1280 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Nickel (Ni) | < 5 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Selenium (Se) | 5.91 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Silver (Ag) | < 5 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |
| Zinc (Zn) | 609 | ug/L | | 5 | 5 | EPA 200.8 | 06/03/2013 13:18 | KRICHR |

Certificate of Laboratory Analysis

Page 7 of 16

*This report shall not be reproduced, except in full.***Order # J13050293**

Site: BioReactor 2 Eff

Collection Date: 15-May-15 7:20 AM

Sample #: 2013011146

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|--|----------|-------|------------|-----|----|---------------|--------------------|---------|
| <u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u> | | | | | | | | |
| Vendor Parameter | Complete | | | | | Vendor Method | | V_AS&C |
| <u>TOTAL DISSOLVED SOLIDS</u> | | | | | | | | |
| TDS | 14000 | mg/L | | 25 | 1 | SM2540C | 05/20/2013 15:36 | JDTALLE |

Site: Filter Blk

Collection Date: 15-May-15 8:00 AM

Sample #: 2013011147

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|--|--------|-------|------------|-----|----|-----------|--------------------|---------|
| <u>DISSOLVED METALS BY ICP-MS</u> | | | | | | | | |
| Selenium (Se) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/06/2013 13:35 | DJSULL1 |

Site: TRIP BLANK

Collection Date: 29-Apr-13 2:00 PM

Sample #: 2013011148

Matrix: OTHER

| Analyte | Result | Units | Qualifiers | RDL | DF | Method | Analysis Date/Time | Analyst |
|--|--------|-------|------------|------|----|-----------|--------------------|---------|
| <u>TOTAL RECOVERABLE METALS BY ICP</u> | | | | | | | | |
| Boron (B) | < 0.05 | mg/L | | 0.05 | 1 | EPA 200.7 | 05/24/2013 12:37 | DJSULL1 |
| <u>TOTAL RECOVERABLE METALS BY ICP-MS</u> | | | | | | | | |
| Arsenic (As) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Cadmium (Cd) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Chromium (Cr) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Copper (Cu) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Nickel (Ni) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Selenium (Se) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Silver (Ag) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |
| Zinc (Zn) | < 1 | ug/L | | 1 | 1 | EPA 200.8 | 06/03/2013 12:58 | KRICAR |



**APPLIED SPECIATION
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

May 24, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly Routine) (LIMS #J13050293)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on May 16, 2013. The samples were received in a sealed cooler at -0.3°C on May 17, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Russell Gerads", written over a light blue horizontal line.

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly Routine) (LIMS #J13050293)

May 24, 2013

1. Sample Reception

Three (3) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on May 16, 2013. Three (3) additional samples in 40ml borosilicate glass bottles (provided by Applied Speciation and Consulting) were submitted for total mercury quantitation. All samples were received in acceptable condition on May 17, 2013 in a sealed container at -0.3°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45 μ m) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on May 21, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on May 18, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ($\text{pH} > 7$) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

The selenate result for the first replicate of the calibration low standard was determined to be a statistical outlier upon application of the Grubbs test. The value for this sample was omitted from calculations used to determine the eMDL associated with selenate results.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Russell Gerads', with a stylized, cursive script.

Russell Gerads
Vice President
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly Routine)

Contact: Jay Perkins

LIMS #J13050293

Date: May 24, 2013

Report Generated by: Russell Gerads

Applied Speciation and Consulting, LLC

Sample Results

| Sample ID | Total Hg | Se(IV) | Se(VI) | SeCN | MeSe(IV) | SeMe | Unknown Se Species (n) |
|------------------|----------|-------------|-------------|-------------|-------------|-------------|------------------------|
| FGD Purge Eff | NR | 35.9 | 41.3 | ND (< 1.1) | 4.8 | ND (< 1.6) | 0.0 (0) |
| BioReactor 1 Inf | 0.160 | 15.2 | 39.2 | ND (< 0.27) | 0.76 | ND (< 0.41) | 0.0 (0) |
| BioReactor 2 Inf | 0.0416 | NR | NR | NR | NR | NR | NR |
| BioReactor 2 Eff | 0.0047 | ND (< 0.67) | ND (< 0.28) | ND (< 0.27) | ND (< 0.41) | ND (< 0.41) | 0.0 (0) |

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly Routine)

Contact: Jay Perkins

LIMS #J13050293

Date: May 24, 2013

Report Generated by: Russell Gerads
Applied Speciation and Consulting, LLC**Quality Control Summary - Preparation Blank Summary**

| Analyte (µg/L) | PBW1 | PBW2 | PBW3 | PBW4 | Mean | StdDev | eMDL* | eMDL 5x | eMDL 250x | eMDL 1000x |
|----------------|---------|--------|--------|--------|--------|--------|--------|---------|-----------|------------|
| Hg | -0.0002 | 0.0004 | 0.0004 | 0.0002 | 0.0002 | 0.0003 | 0.0002 | 0.0008 | - | - |
| Se(IV) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | - | 0.67 | 2.7 |
| Se(VI) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | - | 0.28 | 1.1 |
| SeCN | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | - | 0.27 | 1.1 |
| MeSe(IV) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | - | 0.41 | 1.6 |
| SeMe | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | - | 0.41 | 1.6 |

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

| Analyte (µg/L) | CRM | True Value | Result | Recovery |
|----------------|------------|------------|--------|----------|
| Hg | NIST 1641d | 1568 | 1621 | 103.4 |
| Se(IV) | LCS | 4.79 | 4.728 | 98.8 |
| Se(VI) | LCS | 4.74 | 4.677 | 98.7 |
| SeCN | LCS | 4.46 | 4.588 | 102.9 |
| MeSe(IV) | LCS | 3.24 | 2.926 | 90.4 |
| SeMe | LCS | 4.66 | 4.344 | 93.2 |

Total Mercury & Selenium Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly Routine)

Contact: Jay Perkins

LIMS #J13050293

Date: May 24, 2013

Report Generated by: Russell Gerads

Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

| Analyte (µg/L) | Sample ID | Rep 1 | Rep 2 | Mean | RPD |
|----------------|------------------|------------|------------|--------|-----|
| Hg | BioReactor 2 Eff | 0.0047 | 0.0043 | 0.0045 | 8.9 |
| Se(IV) | Batch QC | 27.7 | 27.1 | 27.4 | 2.2 |
| Se(VI) | Batch QC | 42.6 | 40.3 | 41.4 | 5.6 |
| SeCN | Batch QC | ND (< 1.1) | ND (< 1.1) | NC | NC |
| MeSe(IV) | Batch QC | 2.7 | 2.6 | 2.7 | 2.4 |
| SeMe | Batch QC | ND (< 1.6) | ND (< 1.6) | NC | NC |

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

| Analyte (µg/L) | Sample ID | Spike Conc | MS Result | Recovery | Spike Conc | MSD Result | Recovery | RPD |
|----------------|------------------|------------|-----------|----------|------------|------------|----------|-----|
| Hg | BioReactor 2 Eff | 2.000 | 2.123 | 105.9 | 2.000 | 2.169 | 108.2 | 2.2 |
| Se(IV) | Batch QC | 5560 | 5794 | 103.7 | 5560 | 5813 | 104.0 | 0.3 |
| Se(VI) | Batch QC | 5045 | 5068 | 99.6 | 5045 | 5081 | 99.9 | 0.2 |
| SeCN | Batch QC | 4575 | 4258 | 93.1 | 4575 | 4272 | 93.4 | 0.3 |

Page 2 of 2

Page 1 of 2

| | | | | | |
|--|--|--|--|--|--|
| ORDER# J13080243 | | MATRIX: OTHER | | Analytical Laboratory Use Only | |
| Logged By JT | | Date & Time 5/16/13 1033 | | SAMPLE PROGRAM Water _____ _____ Drinking Water _____ RCRA Waste _____ | |
| Vendor AS&C | | Cooler Temp (C) 3.1 | | Ground NPDES _____ Drinking Water _____ UST _____ | |
| Vendor: | | ¹ Preserv.:1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None | | 4 3,4 3,4 | |
| MR # | | ¹⁶ Analyses Required | | 4 3,4 3,4 | |
| Customer to complete all appropriate non-shaded areas. | | | | | |

| Se Speciation Bottle ID | ¹³ Sample Description or ID |
|-------------------------|--|
| | FGD Purge Eff |
| | EQ Tank Eff. |
| | BioReactor 1 Inf |
| | BioReactor 2 Inf |
| | BioReactor 2 Eff |
| | Filter Blk |
| | Metals Trip Blk |
| | |
| | |


Customer, IMPORTANT!

Please indicate desired turnaround.

| | |
|------------------------|-------|
| 21 Days | _____ |
| *7 Days | _____ |
| *48 Hr | _____ |
| *Other | _____ |
| * Add. Cost Will Apply | _____ |

Page 15 of 16

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



Duke Energy Analytical Laboratory
 Mail Code MGO3A2 (Building 7405)
 13339 Hagers Ferry Rd
 Huntersville, N. C. 28078
 (704) 875-5245
 Fax: (704) 875-4349

Analytical Laboratory Use Only
 ORDER# 513050293 MATRIX: OTHER
 Samples Originating From NC ☐ SC ☐
 Logged By ST Date & Time 5/16/13 1033
 Vendor AS&C 3.1
 Cooler Temp (C)
 Vendor: 15 Preserv.: 1=HCL 2=H₂SO₄ 3=HNO₃ 4=Ice 5=None
 SAMPLE PROGRAM Ground Water ☐ NPDES Drinking Water ☐ UST ☐ RCRA Waste ☐

19 Page 1 of 2 Page 16 of 16
DISTRIBUTION
 ORIGINAL to LAB,
 COPY to CLIENT

1) Project Name **Belews - FGD WWTS (Bi-Monthly Routine)**
 2) Client: **Bill Kennedy, Melonie Martin, Wayne Chapman**
 5) Business Unit: **20003** 6) Process: **BMCEFGD** Mail Code:
 8) Oper. Unit: **BC00** 9) Res. Type: 10) Reso. Center:

IMR #
 Customer to complete all appropriate non-shaded areas.
 Sampling conducted: 2nd and 4th Wednesday

| 13 Sample Description or ID | Date | Time | Signature | 16 Analyses Required | 17 Comp. | 18 Grab | TDS | Br (Dionex) | Metals* + Hg 245.1** | Se (IMS), filtered | NO3-NO2 | Hg 200.8 (V_AS&C) | Se, specification - vendor to AS&C (Important to place filled bottle back into both baggies) |
|-----------------------------|------|------|---------------|----------------------|----------|---------|-----|-------------|----------------------|--------------------|---------|-------------------|--|
| | | | | | | | | | | | | | |
| FGD Purge Eff | 5/15 | 0700 | Travis Thorne | | | | | 1 | 1 | 1 | 1 | | 1 |
| EQ Tank Eff. | 5/15 | 0700 | Travis Thorne | | | | | | 1 | 1 | | | |
| BioReactor 1 Inf | 5/15 | 0910 | Travis Thorne | | | | | | 1** | 1 | 1 | 1 | 1 |
| BioReactor 2 Inf | 5/15 | 0915 | Travis Thorne | | | | | | 1** | | | 1 | |
| BioReactor 2 Eff | 5/15 | 0920 | Travis Thorne | | | | 1 | 1 | 1** | | 1 | 1 | 1 |
| Filter Blk | 5/15 | 0800 | Travis Thorne | | | | | | | 1 | | | |
| Metals Trip Blk | 4-29 | 1900 | | | | | | | 1** | | | | |

LAB USE ONLY
 11 Lab ID
2013011142
 43
 44
 45
 46
 47
 48
 Customer to complete appropriate columns to right

Customer to sign & date below - fill out from left to right.

| | | | |
|--|---|--|--|
| 1) Relinquished By <u>Travis Thorne</u> Date/Time <u>5/15 1400</u> | 2) Accepted By <u>Travis Thorne</u> Date/Time <u>5/16/13 1020</u> | Customer, IMPORTANT! Please indicate desired turnaround. | 22 Requested Turnaround 21 Days _____ 7 Days _____ 48 Hr _____ *Other _____ * Add. Cost Will Apply |
| 3) Relinquished By <u>Travis Thorne</u> Date/Time <u>5/16/13</u> | 4) Accepted By _____ Date/Time _____ | | |
| 5) Relinquished By _____ Date/Time _____ | 6) Accepted By: _____ Date/Time _____ | | |
| 7) Relinquished By _____ Date/Time _____ | 8) Accepted By: _____ Date/Time _____ | | |
| 9) Seal/Locked By _____ Date/Time _____ | 10) Seal/Lock Opened By _____ Date/Time _____ | | |
| 11) Seal/Locked By _____ Date/Time _____ | 12) Seal/Lock Opened By _____ Date/Time _____ | | |
| Comments | | | |

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg